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294G 1787-4

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

DANIEL T. COLBERT et al.

Serial No.: 10/028,231

Filed: December 21, 2001

For: METHOD FOR PURIFICATION OF  
AS-PRODUCED SINGLE-WALL CARBON  
NANOTUBES

Art Unit: --

Examiner: --

CITATION OF PRIOR ART

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir,

In regards to the above-identified application, it is respectfully requested that the Examiner consider each relevant prior art listed below during the examination:

1. Japanese Patent Application Laid-Open (Kokai) No. H06-331309 published in Japan on December 2, 1994;
2. Japanese Patent Application Laid-Open (Kokai) No. H06-252056 published in Japan on September 9, 1994;
3. Japanese Patent Application Laid-Open (Kokai) No. H07-122198 published in Japan on May 12, 1995;
4. Article titled, "Imaging steep, high structures by scanning force microscopy with electron beam deposited tips" by David J. Keller, et al., pages 333-339 in the *Surface Science* magazine published by Elsevier Science Publishers B.V. in 1992 in Holland;
5. Article titled, "New Scanning tunneling microscopy tip for measuring surface topography" by Y. Akama, et al., pages 429-433 in *Vac. Sci. Technol. A* 8 published by American Vacuum Society in 1990;

6. Article titled, "Atomic force microscopy using ZnO whisker tip" by H. Kado, et al., pages 3330-3332 in *Rev. Sci. Instrum* 63 published by American Institute of Physics in 1992;

7. Article titled, "Helical microtubules of graphitic carbon" by Sumio Iijima, pages 56-58 in the *Nature* magazine Vo. 354 published in 1991;

8. Article titled, "Single-shell carbon nanotubes of 1-nm diameter" by Sumio Iijima et al., pages 603-605 in the *Nature* magazine Vo. 363 published in 1993;

9. Article titled, "Aligned Carbon Nanotube Arrays Formed by Cutting a Polymer Resin-Nanotube Composite" by P.M Ajaya, et al., pages 1212-1214 in the *SCIENCE* magazine Vo. 265 published in 1994; and

10. Article titled, "Aligned Carbon Nanotube Films: Production and Optical and Electronic Properties" by Walt A. de Heer, et al., pages 845-847 in the *SCIENCE* magazine Vo. 268 published in 1995.

The concise explanation of the relevance of each listed item is provided below:

The prior art 1 discloses a cathode (a probe for scanning tunneling microscope (STM)) provided with a carbon nanotube and describes that the carbon nanotube has the nature of metals or semiconductors. It has been known that the movement of such a carbon nanotube cathode is controlled by a piezoelectric element.

The prior art 2 discloses a method that positionally fixes a carbon nanotube by certain materials on a substrate; and if the materials are of electrically conductive, then an electrode can be formed at the end of a carbon nanotube.

The prior art 3 discloses forming of electrodes at both ends of a carbon nanotube. More specifically, this prior art discloses a method that allows metal-organic gas to flow to both ends of a carbon nanotube, thus decomposing the ends by electron beam and forming copper films, which act as electrodes, on the ends. It describes that the carbon nanotube has the nature of metals or semiconductors.

The prior art 4 discloses forming of a probe by way of irradiating electron beam to a cantilever which is for a scanning force microscope (an atomic force microscope (AFM))

within a scanning type electronic microscope, thus allowing carbon tips to be deposited and grow, and forming a probe used in a scanning force microscope (atomic force microscope (AFM), a scanning tunneling microscopes (STM), etc.

The prior art 5 discloses that electron beam is irradiated, within a scanning electron microscope (SEM), to a tip used in a scanning tunneling microscope (STM), thus decomposing residual gas and allowing amorphous tip comprising carbon and oxygen to be deposited and grows on the tip. The resultant is called an electron-beam deposited tip (EBD tip), which is used as a scanning tunneling microscope (STM) tip.

The prior art 6 discloses that ZnO, which is a whisker crystal of a tetrapodal structure, is deposited and grows on the surface of the tip end of a cantilever, thus forming an atomic force microscope (AFM) tip. Making an improvement in the accuracy of atomic force microscopes (AFM) and scanning tunneling microscopes (STM) by way of connecting a fine needle to a cantilever had been generally known at the time of filing of the present application.

The prior art 7 is the first published article on multi layered carbon nanotubes (MWCN).

The prior art 8 is the first published article on single layered carbon nanotubes (SWCN).

The prior art 9 discloses a method that, with an ablation method, produces a carbon nanotube aggregation that includes a multiple carbon nanotubes arranged in parallel from a mixed composition of organic resins and carbon nanotubes. Epoxi resins are described as an organic resin that is used. It is thus easy and obvious to those skilled in the art to fix a parallel carbon nanotube aggregation on the surface of a cantilever by resin coating.

The prior art 10 discloses that a multiple numbers of nanotubes are, as seen from Figure 2, arranged in parallel and then in vertical. It is thus easy and obvious to those skilled in the art to fix vertical or parallel carbon nanotube aggregation on the surface of a cantilever by

resin coating. It is further a known fact to those skilled in the art, with the use of such tips, to make a physical measurement of a substance optically, electronically, magnetically, etc.

A listing of the patents and publications relied upon, a copy of each listed patent or publication, and an English translation of all the necessary and pertinent parts of non-English language patent or publication are attached; and the present Citation of Prior Art is submitted in duplicate.

In view of the above, it is respectfully requests that the above listed patents and publications are entered and considered.

Please charge any addition costs incurred to Koda & Androlia Deposit Account 11-1445.

Respectfully Submitted,

By: 

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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to:  
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Name

Signature

10/15/2004

Date



FORM PTO-1449		Docket Number (Optional) 294G 1787-4		Application Number 10/028,231		
INFORMATION DISCLOSURE CITATION IN AN APPLICATION		Applicant Colbert et al.				
(Use several sheets if necessary)		Filing Date 12/21/2001		Group Art Unit --		
U.S. PATENT DOCUMENTS						
EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
FOREIGN PATENT DOCUMENTS						
	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION (YES/NO)
	JP H06-331309	12/2/1994	Japan			
	JP H06-252056	9/9/1994	Japan			
	JP H07-122198	5/12/1995	Japan			
OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)						
	"Imaging steep, high structures by scanning force microscopy with electron beam deposited tips" by David J. Keller, et al., pages 333-339 in the <i>Surface Science</i> magazine published by Elsevier Science Publishers B.V. in 1992 in Holland					
	"New Scanning tunneling microscopy tip for measuring surface topography" by Y. Akama, et al., pages 429-433 in <i>Vac. Sci. Technol. A</i> 8 published by American Vacuum Society in 1990					
	"Atomic force microscopy using ZnO whisker tip" by H. Kado, et al., pages 3330-3332 in <i>Rev. Sci. Instrum</i> 63 published by American Institute of Physics in 1992					
	"Helical microtubules of graphitic carbon" by Sumio Iijima, pages 56-58 in the <i>Nature</i> magazine Vo. 354 published in 1991					
	"Single-shell carbon nanotubes of 1-nm diameter" by Sumio Iijima et al., pages 603-605 in the <i>Nature</i> magazine Vo. 363 published in 1993					
	"Aligned Carbon Nanotube Arrays Formed by Cutting a Polymer Resin-Nanotube Composite" by P.M. Ajaya, et al., pages 1212-1214 in the <i>SCIENCE</i> magazine Vo. 265 published in 1994					
	"Aligned Carbon Nanotube Films: Production and Optical and Electronic Properties" by Walt A. de Heer, et al., pages 845-847 in the <i>SCIENCE</i> magazine Vo. 268 published in 1995					
EXAMINER		DATE CONSIDERED				
EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.						